

MANUFACTURE OF INK JET HEAD

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Abstract

PROBLEM TO BE SOLVED: To connect a wiring pattern to a piezoelectric element by a method wherein an electrode conducted to a wiring pattern at a position corresponding to a piezoelectric element on a sheet-like wiring material and/or a rubber made projection on the piezoelectric element are formed. Surfaces of the electrode and a projection thereon and/or the piezoelectric element and the projection thereon are conductively plated.

SOLUTION: A projection part 3 made of a rubber material is formed by using a dispenser 7 or the like on an electrode 2 arranged at a position corresponding to a piezoelectric element on a wiring substrate 1. Then, plating treatment by a conductive material is applied to surfaces of the rubber projected part 3 and the electrode 2. Lastly the wiring substrate 1 is opposed to a line head substrate 5 on which the piezoelectric element 6 is arranged. Respectively corresponding electrode 2 and piezoelectric element 6 are fixed by pressure so as to be electrically connected via the plated rubber projected part 7, and they are integrated. Herein, the rubber projection part 3 may be formed onto both of the electrode 2 arranged on the wiring substrate 1, and the piezoelectric element 6 arranged on the line head substrate 5.

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【特許請求の範囲】

【請求項1】 板状配線材の表面に印刷された配線パターンと、該板状配線材に沿って配設され、インクジェット記録装置に用いられるラインヘッド基板上の圧電素子とを接続させてインクジェットヘッドを製造するための方法において、上記板状配線材上の、上記圧電素子と対応する位置に配置され、上記配線パターンと導通する電極及び／若しくは、上記圧電素子上に、ゴム材による突起部を形成する突起部形成工程と、上記電極とその上の突起部及び／若しくは、上記圧電素子とその上の突起部の表面に導電性材料によるメッキ処理を施すメッキ処理工程と、上記板状配線材と、上記ラインヘッド基板とを、各々対応する上記電極と上記圧電素子とが上記突起部を介して電気的に接觸するように圧着して一体的に組み付ける組付工程とを具備してなることを特徴とするインクジェットヘッドの製造方法。

【請求項2】 上記板状配線材が配線基板である請求項1記載のインクジェットヘッドの製造方法。

【請求項3】 上記板状配線材がシート状配線材である請求項1記載のインクジェットヘッドの製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、インクジェット記録装置用ヘッドの製造方法に係り、詳しくは板状配線材の表面に印刷された配線パターンと、ラインヘッド基板上の圧電素子とを接続させてインクジェットヘッドを製造するための方法に関するものである。

【0002】

【従来の技術】 従来の、インクジェット記録装置用ヘッドの製造方法における、板状配線材の表面に印刷された配線パターンに導通する電極と、インクヘッド基板上の圧電素子との接続方法には、例えば図3に示すものがある。この方法は、インクヘッド基板34上に配設された圧電素子33と、板状配線材31上に配設された電極32との間に、異方性導電シート35をはさみ、圧力を加え続けることによって上記圧電素子33と上記電極32とを電気的に接続するものである。上記異方性導電シート35には、圧力を加えている間、その部分が導電性をもつ性質があり、本例はこの性質を利用したものである。また、特開平4-345858号公報で提案されている方法の1つとして図4に示すものがある。この方法は、上記の例で使用している異方性導電シート35のかわりに異方性導電膜36を使用し、一定時間圧力と熱を加えることによって圧電素子33と電極32とを電気的、物理的に接続するものである。上記異方性導電膜36には、一定時間圧力及び熱を加えることによって導電性をもちながら硬化する性質があり、本例はこの性質を利用したものである。また、特開平7-32590号公報で提案されている方法の一つとして、図5に示すものがある。この方法は、ディンプル加工を施した板状配線

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材37の弾性突起部37aを、インクヘッド基板34上に配設された圧電素子33に接觸させ、上記弾性突起部37aの裏面側から、該弾性突起部37aの直径よりもやや大きな突起部38aをもつゴムパッド38を押し当てることによって、上記圧電素子33と上記板状配線材37を電気的に接続するものである。

【0003】

【発明が解決しようとする課題】 しかし、前述の従来技術には次のような問題点があった。上記第一番目の例

(図3に示す)では、平板状の異方性導電シート35と圧電素子を設けた平板状のインクヘッド基板34とを圧着させるものであるため、異方性導電シート35に導電性を発揮させるには比較的高い圧力を常に加えておく必要がある。そのため、高圧による圧電素子の破壊、インク流路の変形、圧電素子の振動の抑制などの問題点があった。また、上記特開平4-345858号公報の例

(図4に示す)では、一時的ではあるが高圧を加えることにより、上記例と同様に圧電素子の破壊やインク流路の変形などの問題点があり、同時に熱を加えていることで上記問題点をさらに拡大する可能性があった。また、上記特開平7-32590号公報の例(図5に示す)では、板状配線材37上に、ディンプル加工による弾性突起部37aを必要とする。しかし上記弾性突起部37aは加工の都合上どうしてもある程度の大きさにならざるを得ず、多数の接点が高密度で並ぶインクジェットヘッドの接続部には適さない。従って本発明の目的は、多数の接点が高密度で並ぶインクジェットヘッドの接続方法において、上記接点によって接続される板状配線材の表面に印刷された配線パターンと、ラインヘッド基板上の圧電素子とを、高圧や熱を加えることなく確実に接続させて、インクジェットヘッドを製造するための方法を提供することである。

【0004】

【課題を解決するための手段】 上記目的を達成するためには本発明は、板状配線材の表面に印刷された配線パターンと、該板状配線材に沿って配設され、インクジェット記録装置に用いられるラインヘッド基板上の圧電素子とを接続させてインクジェットヘッドを製造するための方法において、上記板状配線材上の、上記圧電素子と対応する位置に配置され、上記配線パターンと導通する電極及び／若しくは、上記圧電素子上に、ゴム材による突起部を形成する突起部形成工程と、上記電極とその上の突起部及び／若しくは、上記圧電素子とその上の突起部の表面に導電性材料によるメッキ処理を施すメッキ処理工程と、上記板状配線材と、上記ラインヘッド基板とを、各々対応する上記電極と上記圧電素子とが上記突起部を介して電気的に接觸するように圧着して一体的に組み付ける組付工程とを具備してなることを特徴とするインクジェットヘッドの製造方法として構成されている。上記板状配線材としては、板状の硬質ボードよりなる、いわ

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ゆる配線基板や柔軟なシート材料である、いわゆるFPCといった既存の配線材を用いることができる。

【0005】

【発明の実施の形態】以下、図面を参照して本発明を具体化した実施の形態について説明し、本発明の理解に供する。なお、本実施の形態及びそれに続く実施例は、本発明の実施の具体例であり、本発明の技術的範囲を限定する性格のものではない。ここに、図1は本発明の実施の形態に係るインクジェットヘッドの接続方法を示す断面図、図2は本発明の実施例に係るインクジェットヘッドの接続方法を示す断面図である。本実施の形態に係るインクジェットヘッドの製造方法を図1を用いて説明する。まず、図1の(a)に示すように、配線基板1上の、後述する圧電素子と対応する位置に配設された電極2上に、ディスペンサ7等を使用してゴム材による突起部3を形成する(突起部形成工程)。次に、図2の

(b)に示すように、上記ゴム突起部3及び上記電極2の表面に導電性材料によるメッキ処理を施す(メッキ処理工程)。最後に、上記配線基板1を、圧電素子6を配設したラインヘッド基板5と対向させ、各々対応する上記電極2と上記圧電素子6とが、上記メッキ処理を施したゴム突起部7を介して、電気的に接続されるように圧着し、一体的に組み付ける(組付工程)。

【0006】この方法によれば、配線基板1表面の配線パターンと圧電素子6とが、上記電極2及び上記電極2上に形成されたゴム突起部3の表面に施されたメッキ部4を介して電気的に接続されると共に、それらの接続状態が、上記組付工程により永続的に保たれる。この時、上記組付工程によって、従来の技術の第1の例と同じように、圧電素子6に対して圧力が常に加わり続けることになるが、電極2と圧電素子6との間に柔軟なゴムが介在するので、上記圧力は、上記従来の技術の第1の例のような高圧力は必要としない。また、上記突起部形成工程及びメッキ処理工程は、微細部分への処理に対しても容易に対応可能であり、多数の電極が高密度で並ぶインクジェットヘッドの接続に適している。以上のように、この実施の形態では、突起部形成工程、メッキ処理工程、及び組付工程によって、比較的小さな圧力下で配線パターンと圧電素子との永続的接続が達成されるため、多数の接点が高密度で並ぶインクジェットヘッドの接続を、高圧や熱を用いることなく行うことができるので、圧電素子の寿命を延ばし、振動抑制といった問題も発生しない。

【0007】

【実施例】本実施例に係るインクジェットヘッドの接続方法を図2に示す。上記実施の形態では、突起部形成工程及びメッキ処理工程を、配線基板1上に配設された電極2に対して行っているが、本実施例では、上記突起部形成工程及びメッキ処理工程を、ラインヘッド基板5上に配設された圧電素子6に対して行うものである(図2

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の(a)及び(b))。従って、組付工程(図2の(c))においては、ゴム突起部3の位置が違うだけで、本実施例も上記実施の形態と同様の効果を得ることができる。また、上記突起部形成工程及びメッキ処理工程を、配線基板1上に配設された電極2、及びラインヘッド基板5上に配設された圧電素子6の双方に施すことも可能である。このように、配線基板1上に配設された電極2、及びラインヘッド基板5上に配設された圧電素子6の双方にゴム突起部3を形成することにより、ますます小さい力で確実な接続が可能となる。また、上記配線基板1にかえてFPC等のシート状配線材を使用することもできる。その場合、上記シート状配線材は柔軟なシート材料であるため、組付工程における圧着時には別の基板や補強板等の補強材を使用する必要がある。

【0008】

【発明の効果】以上説明したように、本発明で提案する方法によって、多数の接点が高密度で並ぶインクジェットヘッドの接続部においても、板状配線材の表面に印刷された配線パターンとラインヘッド基板上の圧電素子とを、高圧や熱を加えることなく、従って圧電素子の寿命を縮減することなく、更に圧電素子の振動を抑制することもなく、確実に接続し、インクジェットヘッドを製造することができる。

【図面の簡単な説明】

【図1】 本発明の実施の形態に係るインクジェットヘッドの接続方法を示す断面図。

【図2】 本発明の実施例に係るインクジェットヘッドの接続方法を示す断面図。

【図3】 従来のインクジェットヘッドの接続方法を示す図。

【図4】 従来のインクジェットヘッドの接続方法を示す図。

【図5】 従来のインクジェットヘッドの接続方法を示す図。

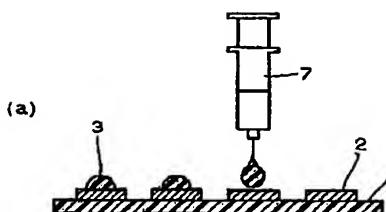
【符号の説明】

- 1 …配線基板
- 2 …電極
- 3 …ゴム突起部
- 4 …メッキ部
- 5 …ラインヘッド基板
- 6 …圧電素子
- 7 …ディスペンサ
- 31 …板状配線材
- 32 …電極
- 33 …圧電素子
- 34 …インクヘッド基板
- 35 …異方性導電シート
- 36 …異方性導電膜
- 37 …板状配線材
- 38 …ゴムパッド

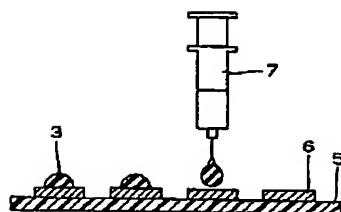
(4)

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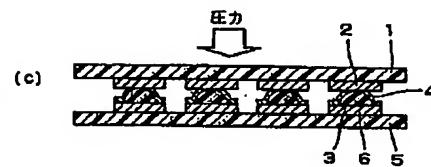
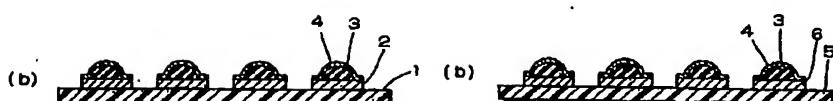
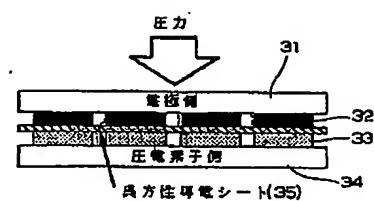
【図 1】



【図 2】

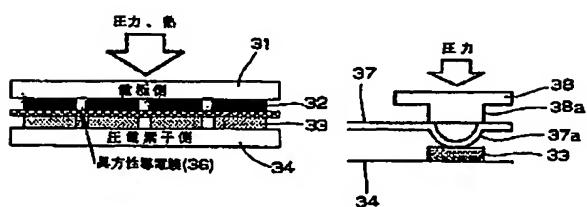


【図 3】



【図 4】

【図 5】



PATENT ABSTRACTS OF JAPAN

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(72)Inventor : UMENO KOJI

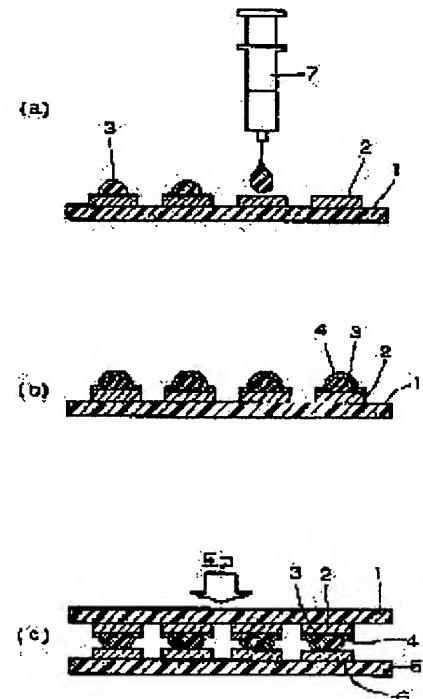
UMETANI YOSHINOBU

(54) MANUFACTURE OF INK JET HEAD

(57)Abstract:

PROBLEM TO BE SOLVED: To connect a wiring pattern to a piezoelectric element by a method wherein an electrode conducted to a wiring pattern at a position corresponding to a piezoelectric element on a sheet-like wiring material and/or a rubber made projection on the piezoelectric element are formed. Surfaces of the electrode and a projection thereon and/or the piezoelectric element and the projection thereon are conductively plated.

SOLUTION: A projection part 3 made of a rubber material is formed by using a dispenser 7 or the like on an electrode 2 arranged at a position corresponding to a piezoelectric element on a wiring substrate 1. Then, plating treatment by a conductive material is applied to surfaces of the rubber projected part 3 and the electrode 2. Lastly the wiring substrate 1 is opposed to a line head substrate 5 on which the piezoelectric element 6 is arranged. Respectively corresponding electrode 2 and piezoelectric element 6 are fixed by pressure so as to be electrically connected via the plated rubber projected part 7, and they are integrated. Herein, the rubber projection part 3 may be formed onto both of the electrode 2 arranged on the wiring substrate 1, and the piezoelectric element 6 arranged on the line head substrate 5.



LEGAL STATUS

[Date of request for examination]

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]

[Claim 1] In the method for being arranged along with the circuit pattern printed by the front face of tabular wiring material, and this tabular wiring material, connecting the piezoelectric device on the line head substrate used for an ink-jet recording device, and manufacturing an ink-jet head the electrode and/through which it is arranged in the above-mentioned piezoelectric device on the above-mentioned tabular wiring material, and a corresponding position, and flows with the above-mentioned circuit pattern -- or the height formation process which forms the height by rubber material on the above-mentioned piezoelectric device, the above-mentioned electrode and the height on it, and/-- or The above-mentioned piezoelectric device and plating down stream processing which performs plating processing by conductive material to the front face of the height on it, The manufacture method of the ink-jet head which possesses the process with a group which sticks the above-mentioned tabular wiring material and the above-mentioned line head substrate by pressure so that the above-mentioned electrode and the above-mentioned piezoelectric device which correspond respectively may contact electrically through the above-mentioned height, and attaches them in one, and is characterized by the bird clapper.

[Claim 2] The manufacture method of an ink-jet head according to claim 1 that the above-mentioned tabular wiring material is a wiring substrate.

[Claim 3] The manufacture method of an ink-jet head according to claim 1 that the above-mentioned tabular wiring material is sheet-like wiring material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the manufacture method of the head for ink-jet recording devices, and relates to the method for connecting the circuit pattern printed by the front face of tabular wiring material in detail, and the piezoelectric device on a line head substrate, and manufacturing an ink-jet head.

[0002]

[Description of the Prior Art] There are some which are shown in drawing 3 in the connection method of the electrode which flows in the circuit pattern printed by the front face of the tabular wiring material in the conventional manufacture method of the head for ink-jet recording devices, and the piezoelectric device on an ink head substrate. This method sandwiches the anisotropy electric conduction sheet 35 between the piezoelectric device 33 arranged on the ink head substrate 34, and the electrode 32 arranged on the tabular wiring material 31, and connects electrically the above-mentioned piezoelectric device 33 and the above-mentioned electrode 32 by continuing applying a pressure. While applying the pressure, there is a property in which the portion has conductivity and this example uses this property for the above-mentioned anisotropy electric conduction sheet 35. Moreover, there are some which are shown in drawing 4 as one of the methods proposed by JP,4-345858,A. The anisotropy electric conduction film 36 is used for this method instead of the anisotropy electric conduction sheet 35 currently used in the above-mentioned example, and it connects a piezoelectric device 33 and an electrode 32 electrically and physically by applying a fixed time pressure and heat. There is a property hardened while it has conductivity in the above-mentioned anisotropy electric conduction film 36 by applying a fixed time pressure and heat, and this example uses this property. Moreover, there are some which are shown in drawing 5 as one of the methods proposed by JP,7-32590,A. This method connects the above-mentioned tabular wiring material 37 with the above-mentioned piezoelectric device 33 electrically by contacting elastic height 37a of the tabular wiring material 37 which gave dimple processing to the piezoelectric device 33 arranged on the ink head substrate 34, and pressing the rubber slab 38 which has mist and big height 38a from the diameter of this elastic height 37a from the rear-face side of the above-mentioned elastic height 37a.

[0003]

[Problem(s) to be Solved by the Invention] However, there were the following troubles in the above-mentioned conventional technology. In the first above-mentioned example (shown in drawing 3), since it is the thing to which the plate-like anisotropy electric conduction sheet 35 and the plate-like ink head substrate 34 which prepared the piezoelectric device are made to stick by pressure, it is always necessary to apply a pressure comparatively high to making the anisotropy electric conduction sheet 35 demonstrate conductivity. Therefore, there were troubles, such as destruction of the piezoelectric device by high pressure, deformation of ink passage, and suppression of vibration of a piezoelectric device. Moreover, in the example (shown in drawing 4) of above-mentioned JP,4-345858,A, although it was temporary, by applying high pressure, there are troubles, such as destruction of a piezoelectric device and deformation of ink passage, as well as the above-mentioned example, and the above-mentioned trouble may have been further expanded by applying heat simultaneously. Moreover, in the example (shown in drawing 5) of above-mentioned JP,7-32590,A, elastic height 37a by dimple processing is needed on the tabular wiring material 37. however, the above-mentioned elastic height 37a -- the convenience top of processing -- a certain amount of [surely] size -- not becoming -- it does not obtain and is not suitable for the connection of the ink-jet head with which many contacts are located in a line by high density Therefore, the purpose of this invention is offering the method for connecting certainly the circuit pattern printed by the front face of tabular wiring material to which many contacts' are connected by the above-mentioned contact in the connection method of the ink-jet head located in a line by high density, and the piezoelectric device on a line head substrate, without applying high pressure and heat, and manufacturing an ink-jet head.

[0004]

[Means for Solving the Problem] The circuit pattern by which this invention was printed by the front face of tabular wiring material in order to attain the above-mentioned purpose, In the method for being arranged along with this tabular wiring material, connecting the piezoelectric device on the line head substrate used for an ink-jet recording device, and manufacturing an ink-jet head the electrode and/through which it is arranged in the above-mentioned piezoelectric device on the above-mentioned tabular wiring material, and a corresponding position, and flows with the above-mentioned circuit pattern -- or the height formation process which forms the height by rubber material on the above-mentioned piezoelectric device, the above-mentioned electrode and the height on it, and/- or The above-mentioned piezoelectric device and plating down stream processing which performs plating processing by conductive material to the front face of the height on it, It is constituted as the manufacture method of the ink-jet head which possesses the process with a group which sticks the above-mentioned tabular wiring material and the above-mentioned line head substrate by pressure so that the above-mentioned electrode and the above-mentioned piezoelectric device which correspond respectively may contact electrically through the above-mentioned height, and attaches them in one, and is characterized by the bird clapper. Existing wiring material which is the so-called wiring substrate which consists of a hard board of a tabular, and a flexible charge of a web material as the above-mentioned tabular wiring material and which is called the so-called FPC can be used.

[0005]

[Embodiments of the Invention] The gestalt of the operation which materialized this invention with reference to the drawing is explained hereafter, and an understanding of this invention is presented. In addition, the example following the gestalt of this operation and it is an example of operation of this invention, and is not the thing of the character which limits the technical range of this invention. The cross section showing the connection method of the ink-jet head which drawing 1 requires for the gestalt of operation of this invention here, and drawing 2 are the cross sections showing the connection method of the ink-jet head concerning the example of this invention. The manufacture method of the ink JIETO head concerning the gestalt of this operation is explained using drawing 1 . First, as shown in (a) of drawing 1 , the height 3 by rubber material is formed using dispenser 7 grade on the electrode 2 arranged in the piezoelectric device later mentioned on the wiring substrate 1, and the corresponding position (height formation process). Next, as shown in (b) of drawing 2 , plating processing by conductive material is performed to the front face of the above-mentioned rubber height 3 and the above-mentioned electrode 2 (plating down stream processing). The above-mentioned wiring substrate 1 is made to counter finally with the line head substrate 5 which arranged the piezoelectric device 6, it is stuck by pressure so that the above-mentioned electrode 2 which corresponds respectively, and the above-mentioned piezoelectric device 6 may be electrically connected through the rubber height 7 which performed the above-mentioned plating processing, and it attaches in one (process with a group).

[0006] While the circuit pattern and piezoelectric device 6 of wiring substrate 1 front face are electrically connected through the plating section 4 given to the front face of the rubber height 3 formed on the above-mentioned electrode 2 and the above-mentioned electrode 2 according to this method, those connection states are kept permanent by the above-mentioned process with a group. although a pressure will always continue being added to a piezoelectric device 6 like the 1st example of a Prior art according to the above-mentioned process with a group at this time, since flexible rubber intervenes between an electrode 2 and a piezoelectric device 6, high-pressure force [like the example which is the 1st of the above-mentioned Prior art] whose above-mentioned pressure is is not needed Moreover, the above-mentioned height formation process and plating down stream processing can respond easily also to the processing to a detailed portion, and are suitable for connection of the ink-jet head with which many electrodes are located in a line by high density. As mentioned above, with the form of this operation, since the permanent connection between a circuit pattern and a piezoelectric device is attained under a comparatively small pressure and connection of the ink-jet head with which many contacts are located in a line by high density can be made according to a height formation process, plating down stream processing, and a process with a group, without using high pressure and heat, the life of a piezoelectric device is prolonged and the problem of oscillating suppression is not generated, either.

[0007]

[Example] The connection method of the ink-jet head concerning this example is shown in drawing 2 . Although a height formation process and plating down stream processing are performed to the electrode 2 arranged on the wiring substrate 1 with the gestalt of the above-mentioned implementation, the above-mentioned height formation process and plating down stream processing are performed to the piezoelectric device 6 arranged on the line head substrate 5 in this example ((a) and (b) of drawing 2). Therefore, in a process with a group ((c) of drawing 2), the position of the rubber height 3 is only different, and this example can also acquire the same effect as the gestalt of the above-mentioned implementation. Moreover, it is also possible to give the both sides of the electrode 2 arranged on the wiring substrate 1 and the piezoelectric device 6 arranged on the line head substrate 5 the above-mentioned height formation process

and plating down stream processing. Thus, positive connection is attained by the still smaller force by forming the rubber height 3 in the both sides of the electrode 2 arranged on the wiring substrate 1, and the piezoelectric device 6 arranged on the line head substrate 5. Moreover, it can change to the above-mentioned wiring substrate 1, and sheet-like wiring material, such as FPC, can also be used. In this case, since the above-mentioned sheet-like wiring material is a flexible charge of a web material, it needs to use reinforcing materials, such as another substrate and a back up plate, at the time of sticking by pressure in a process with a group.

[0008]

[Effect of the Invention] As explained above, by the method of proposing by this invention, without suppressing vibration of a piezoelectric device further, without [without it applies the circuit pattern by which many contacts were printed by the front face of tabular wiring material also in the connection of the ink-jet head located in a line by high density and the piezoelectric device on a line head substrate for high pressure or heat, therefore] cutting down the life of a piezoelectric device, it can connect certainly and an ink-jet head can be manufactured.

[Translation done.]

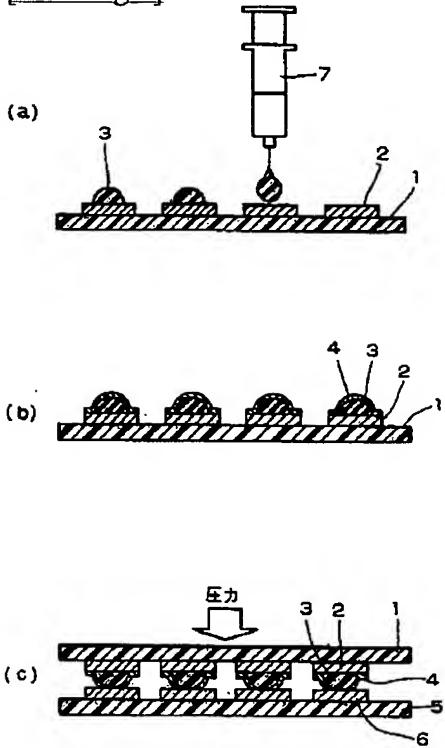
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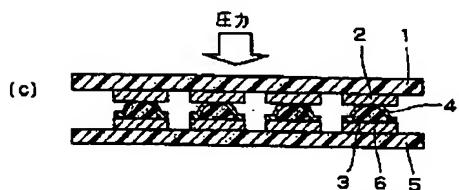
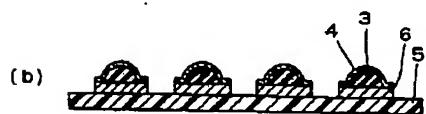
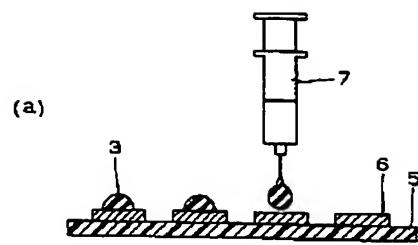
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DRAWINGS

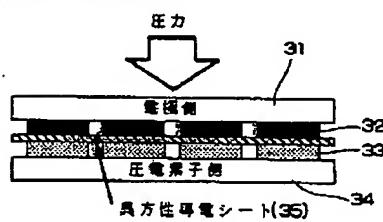
[Drawing 1]



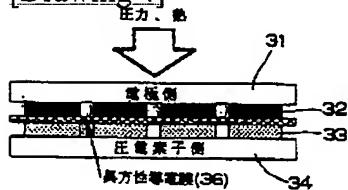
[Drawing 2]



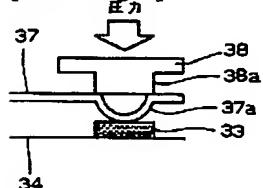
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]